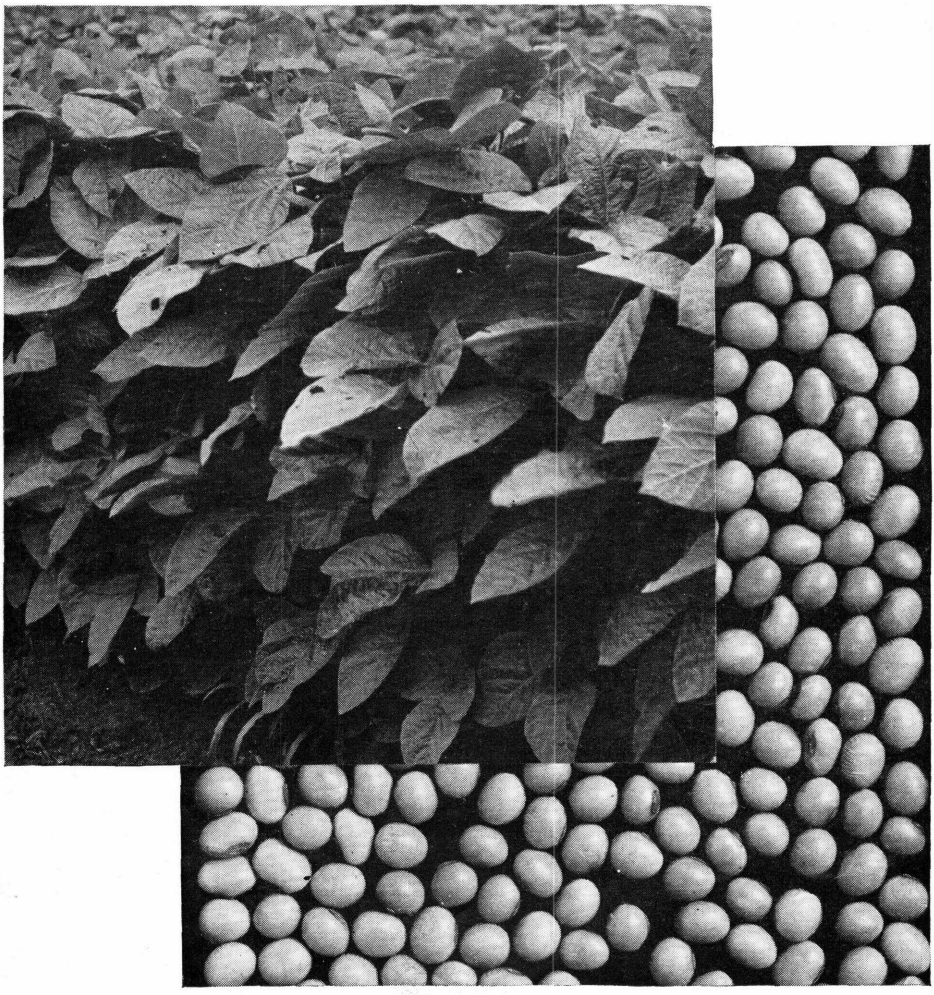
SOYBEAN PRODUCTION

FOR HAY AND BEANS



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SOYBEANS have gained rapidly in importance as a bean crop with the development of improved varieties and more efficient cultural practices. They are important also as a supplementary hay crop.

Soybeans are best fitted for hay when the seeds are about one-half developed. Soybean hay is a little more difficult to cure than hay from other legumes but may be handled successfully by practically the same methods. It requires thorough curing before being stacked, housed, or baled, since danger of molding occurs when the hay is stored too soon after a rain or baled too green.

Unless a special harvester or combine is used, soybeans should be cut for seed when the beans are in the hard-dough stage. The most successful method of harvesting is with a combine-harvester. Cylinder speed should be reduced and concaves adjusted to prevent cracking of the beans. The ordinary grain separator can be adjusted to thresh soybeans without cracking or splitting them. Special bean and pea separators are also extensively used.

Soybeans should be thoroughly dried before storing. Under exceptional conditions only are soybeans attacked by weevils.

United States standards are now used extensively for grading and marketing soybeans.

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SOYBEAN PRODUCTION FOR HAY AND BEANS

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INTRODUCTION

THE SOYBEAN, an annual legume, has found a permanent place as a bean and forage crop in many farming systems, especially in the eastern half of the United States. At first the acreage of soybeans harvested for hay was larger than the acreage harvested for beans. The reverse has been true since 1935 in the Corn Belt States, 1941 in the United States as a whole. Although it has continued to grow in use as a forage crop, a greater percentage of the increased acreages during recent years has been for the commercial production of beans. In 1929, 63 percent of the total acreage devoted to soybeans was harvested for hay; in 1943, 21 percent, and in 1948, 10 percent.

The methods employed in the production of soybean hay and beans vary with the farming practices. Increased acreage and greater utilization of the soybean have brought about more efficient and economical methods of production and new or improved types of machinery. Perhaps no greater advance has been made in any farm practice than in the production of the soybean crop. The combine-harvester has been one of the most important factors in the economical production of soybeans.

SOYBEAN HAY PRODUCTION

The soybean is not a difficult crop to grow for hay, and when cut at the proper stage of growth and properly cured it makes an excellent hay of high feeding value for all classes of roughage-consuming livestock. The acreage of soybeans for hay in the United States is confined largely to the eastern half of the country, as shown in figure 1.

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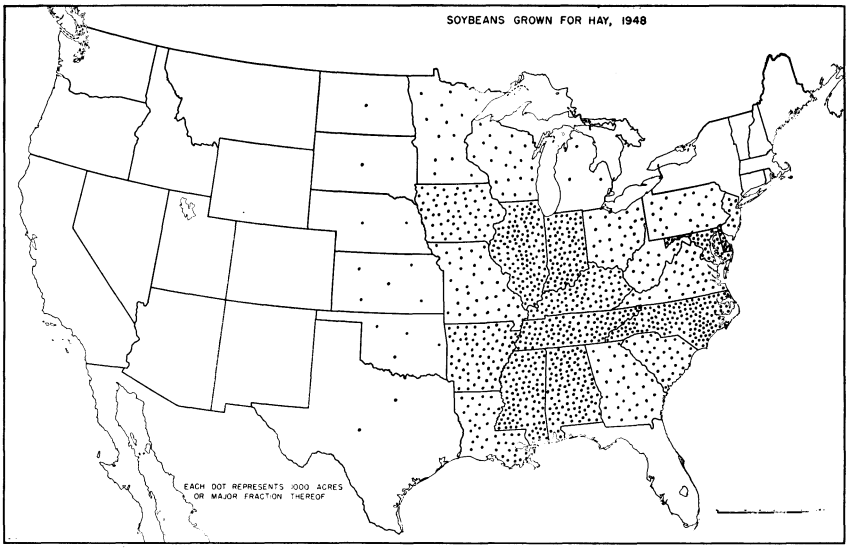


Figure 1.—Acreage of soybeans for hay is confined largely to the eastern half of the United States.

The chief objection to the soybean for hay is the rather coarse stems, but this can be overcome largely if proper attention is given to rate and time of planting, and time of harvesting. The soybean is widely adapted to various soil types, can be used in any rotation, and has a lower lime requirement than red clover, sweetclover, or alfalfa. It is not to be considered as a competitor of clover, alfalfa, or lespedeza in regions suited to these crops, but rather as a supplement and addition to them.

In case of the failure of an old or new clover or alfalfa seeding, winter grain, or a spring crop, there is ample time to grow a crop of soybeans for hay. Soybeans are also excellent as a summer catch crop following early crops or in fields not in the regular rotation. In the growing of soybeans for hay, the variety and methods of production used will determine largely the quality of the crop.

VARIETIES FOR HAY

The varieties most suitable for hay are those producing moderately fine stems with an abundance of leaves, as this gives the best quality hay and minimizes curing difficulties. In general, there is little difference in total hay yield between adapted seed varieties and the more viny, so-called hay varieties.

Varieties of the "hay type" most commonly used in the Northern States in order of earliness are: Wisconsin Black, Cayuga, Wilson, Peking, Kingwa, Ebony, and Virginia. In the Southern States some of the more commonly grown "hay type" varieties are: Laredo, Tanner, Hayseed, Palmetto, Gatan, Otootan, and Avoyelles. These varieties make rather tall, viny growth and often lodge very badly. When lodging occurs, most of the leaves on the under side are shed and the advantage of finer stems is offset by the lower leaf percentage. Most of these varieties give rather low seed yields, and consequently, seed is

higher in price than that of adapted bean varieties. This difference is offset in part by the smaller seed size and corresponding greater number of beans per bushel found in some of the "hay type" varieties.

When a bean variety is planted for hay, the stem size can be reduced by thicker planting than is customary when the crop is to be saved for seed. In the South, delaying planting until mid-June or later aids materially in improving the quality of hay.

METHODS OF PLANTING FOR HAY

A better quality of soybean hay can be produced if the field is kept free of weeds. Weeds can be controlled best if the soybeans are planted in rows and cultivated once or twice. A good stand is an important factor in weed control. Twelve to eighteen seeds per foot in rows 24 to 30 inches apart will give an excellent ground coverage in a short time, which will aid materially in weed control. When soybeans are seeded with a grain drill, provision should be made to go over the field two or three times with a drag harrow or rotary hoe while the plants are small, to destroy weeds that are just emerging.

TIME OF CUTTING

Cutting soybeans at different stages of growth has been found to influence the yield, composition, and the ease of curing the hay.

The time of cutting varies greatly in various sections of the country, ranging from the stage when the pods are beginning to form until the seeds are three-fourths to full grown. In many regions the crop is considered best fitted for hay when the seeds are about half developed. If the crop is cut earlier the total yield will not be so large, and the difficulty of curing will be much greater. If the cutting is delayed, the stems rapidly become hard and woody. Later a heavy loss in leaves will occur, thus decreasing the palatability and feeding value of the hay.

The problem as to the best time to cut soybeans for hay is an extremely important one and has been the subject of research by several State agricultural experiment stations.

Yields of hay harvested at full-bloom stage consistently were found to approximate half that obtained when seeds were one-half to three-fourths developed. Percentage of leaves in hay decreased steadily with degree of maturity. Experiments did not agree as to effect of time of cutting in protein content of the hay. In Ohio, protein content was highest at full-bloom stage and decreased at two later stages; in Illinois, no differences resulted from various times of cutting. The largest yields of protein always were obtained at the same stage as the largest yields of hay. In Illinois, phosphorus and lime content of hay doubled from early harvest to late cutting stages. In one experiment late harvest was found to increase losses during curing as rainy weather was encountered at that time.

Palatability of soybean hay cut at different stages of growth gave varying results at several experiment stations. In some tests early-cut hay was the more palatable, while in others the late-cut hay was the most successful. Livestock usually refused more stems from late-cut hay than early-cut hay, but at the Illinois Agricultural Experiment Station more early-cut hay was refused. The feeding value of immature and mature soybean hay as measured by milk and fat production was compared at the Purdue Agricultural Experiment Station.

For each ton of mature hay fed, cows produced 128 pounds more milk than for immature hay. Only 2.45 percent of the early-cut hay and 4.45 percent of the late-cut hay was refused.

In a later test by this station, feeding of intermediate and late-cut hay was tested for milk and butterfat production. Late-cut hay produced 195 pounds more milk and 20 pounds more butterfat with 75 pounds less dry matter consumed. However, in similar feeding tests at the Illinois Agricultural Experiment Station, yearling dairy heifers fed soybean hay from different stages of cutting, showed no significant differences in weight that would indicate either early- or late-cut hay was distinctly superior in feeding value.

In areas where late summer droughts occur, it is usually desirable to cut soybeans for hay as soon as leaves begin to shed rather than to wait for the preferred stage of pod development.

METHOD OF CUTTING

Various methods of cutting the soybean crop for hay are practiced, but the mowing machine is the implement most generally used, and, as shown in figure 2, it can be used to produce an excellent hay. Some

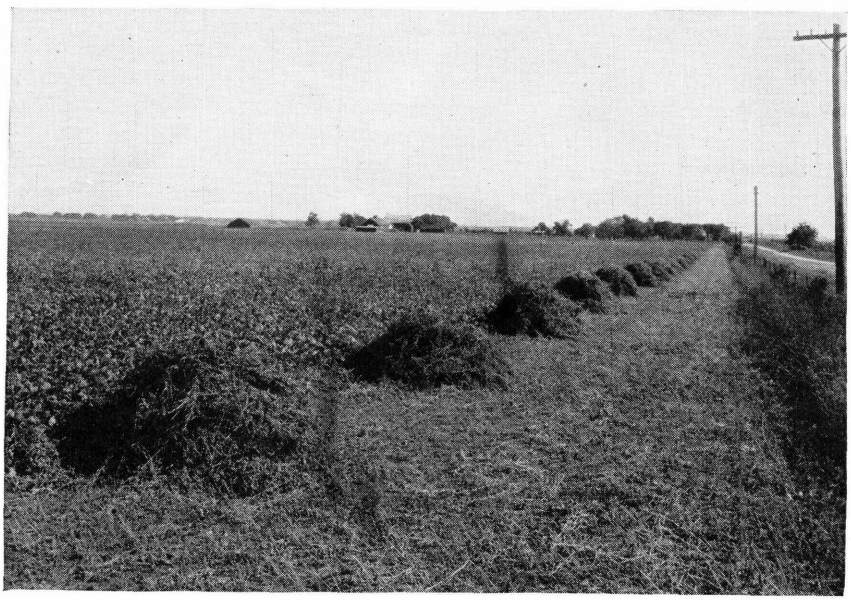


Figure 2.—A common practice in some sections is to cut a swath around a field for hay. The rest of the field not needed for hay may be saved for bean production.

objections to cutting with a mower and curing in the swath and windrow are loss of many leaves and collection of dirt and trash, thus producing a poor quality of hay. The ordinary grain binder is also used in some sections in cutting the crop for hay and silage. It is claimed that soybeans do not cure as well in cocks as they do when shocked in upright bundles.

For the best results with a binder, soybeans should be seeded with a grain drill with as many holes stopped as necessary to make lands

not more than 4½ feet wide and about 1 foot apart. This leaves space for the divide board so that a clean swath may be cut. Soybean plants contain a rather high percentage of moisture, and when cut with a binder, the bundles should be bound loosely and placed in small open shocks. There is some danger in damp weather of loss from molding in the center of the bundle, but in favorable weather this method is satisfactory. It is said to assure a hay of maximum leafiness.

CURING

The methods used in curing soybeans for hay vary in different sections, but if the producer is careful hay of good appearance and quality can generally be made. Some experience is necessary in curing soybean hay, since it is more difficult to cure than alfalfa or clover, but it can be handled by about the same methods. Greater difficulty will be experienced in curing hay of varieties that mature later than adapted varieties in the given locality.

The stems of soybeans cure very slowly in comparison to the leaves; consequently, special attention is required to save the leaves which, as with all legume hays, are the most valuable part. Late-cut soybeans with well-developed pods require a much longer time to cure, even with good weather conditions, because moisture in the seed disappears very slowly. It is possible, however, to produce high-quality hay from late-cut soybeans.

To make hay, the most common method is to cut the crop as soon as the dew is off the plants and leave it in the swath until thoroughly wilted. After wilting and before the leaves become dry and brittle, the hay is raked into windrows and left a day or two, depending on the weather, and then placed in tall, narrow cocks or bunches to complete the curing. After 4 or 5 days of fair weather, soybean hay is ready to be stacked or housed. The cocks or bunches should be opened a few hours before hauling to dry out thoroughly.

In many sections soybean hay is cured entirely in the swath. The crop is cut with the mower and left on the ground until entirely cured. It is then raked either on a cloudy day, in the evening, or in the morning while the dew is still on the hay. Though the crop is cured more rapidly by this method, the hay is subject to more bleaching, and to a greater loss of beans and leaves in case of prolonged wet weather.

Another method used successfully is to allow the crop to lie in the swath for a day or two and then rake into windrows to complete curing. Usually it will be found necessary to turn the windrows. Hay of a better color than that cured by the swath method is thus obtained, but in rainy weather the windrows are hard to dry out, more handling is required, and the result may be a greater loss of leaves and beans.

The Ohio Agricultural Experiment Station, in studying methods of curing soybeans for hay, found that when reasonably dry curing weather prevailed, soybeans in side-delivery windrows raked after wilting and turned occasionally cured just as rapidly and more uniformly than when left in the swath to complete curing. It was also found that raking the cut plants at once usually resulted in slower curing, but produced an excellent quality of hay.

At the Mississippi Agricultural Experiment Station, soybeans run through a stem-crushing machine were ready for baling by the afternoon of the second day. Uncrushed stems still contained 45 percent

moisture at this time and were not ready for baling until the afternoon of the fifth day. Crushing the stems reduced the length of the curing period about 70 percent and the quality of the hay was improved.

The Pennsylvania Agricultural Experiment Station found that crushing soybean plants to be used for hay reduced the time for curing from 17 to 5 days. However, many leaves and parts of stems were lost by this process. Machinery for crushing plants is rather expensive for a small acreage.

Curing frames or poles (figure 3) generally are used in the Southern States and to some extent in other sections under unfavorable

Figure 3.—Soybean hay after being partially cured in the windrow may be stacked on frames to cure thoroughly. This is especially desirable in humid areas before stacking or baling.

weather conditions. Though the plants, as a rule, should be well wilted when placed on a frame or pole, well-cured hay of good quality may be obtained by placing the crop on the frames or poles as soon as cut.

ARTIFICIAL DRYING

Barn driers have proved helpful in many areas for producing high quality soybean hay. Water loss from plants is greatest for the first few hours after cutting. To take advantage of this situation, soybean hay should be allowed to field dry from 4 to 6 hours during which time the moisture content will drop from approximately 75 to 40 percent. This incompletely dried hay can be placed in a barn equipped with air ducts and a blower and reduced to 20 percent moisture hay in 4 days during clear weather. With cloudy weather, curing takes more

time, but if adequate forced ventilation is provided there is little danger from spoilage.

Investigations conducted by the Tennessee Valley Authority show that by using a barn equipped with air ducts and forced ventilation, an improved quality of hay can be produced at a relatively low cost. By placing the soybean hay in the barn drier the day it is cut, the loss from leaching or bleaching and leaf shedding is almost completely eliminated.

STORAGE AND BALING

Soybean stalks and beans yield their moisture rather slowly. Since there is danger of heating and molding if the stalks and pods, as well as the leaves, are not sufficiently dry, there should be no haste in storing or baling. To test the fitness of the hay for storage or baling twist a handful of hay in the hands. If it breaks easily when twisted once or twice, it is well cured, but if it is hard to break and sap is squeezed out of the stems or pods, it is not in condition to be stored or baled.

When left in the open, soybean hay should be arranged in good-sized stacks, and grass or some other material that sheds rain should be placed over each stack. Placing poles or logs in the center of the stack so as to provide an air passage will greatly lessen the danger of spoiling. Spoilage may also be avoided by storing the soybean hay and some kind of cereal straw, in alternate layers, in the stack or mow. In no case, however, should the hay be stacked or housed until thoroughly cured.

The baling of soybean hay has increased in many sections of the Southern and Corn Belt States. Although the hay is often baled directly from the windrow, or from the cocks, this is not desirable in humid regions. Hay from the field is often baled too soon. It may appear to be sufficiently cured, but on examination it will be found that only the leaves are dry enough while the stems and pods are still sappy. If such hay is baled, it will go through the process of sweating and a damaged hay of poor quality will result. Therefore, in baling soybean hay from the field, the hay should be thoroughly cured. After soybean hay has been stacked or housed, a process of sweating takes place, requiring 4 to 8 weeks, after which there is no danger of heating in the bale.

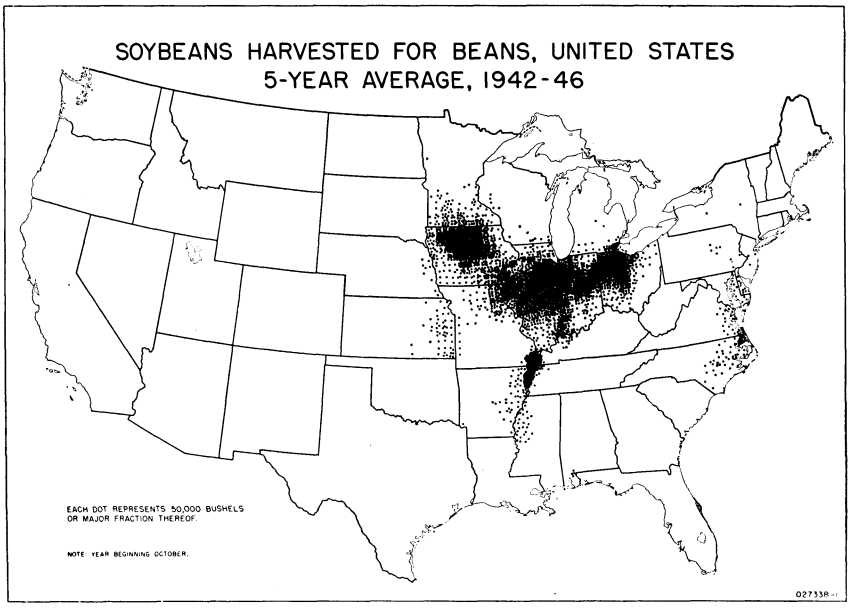
YIELDS OF HAY

Yields of approximately 2 tons of soybean hay per acre can be expected under favorable conditions. Yields of 4 to 5 tons per acre have been obtained from well-fertilized soils in the Coastal Plain area of the Southeastern States. In the Southern States, it is desirable to sacrifice some yield to gain quality by delaying the planting date.

SOYBEAN PRODUCTION

At first, and until recent years, soybeans in the United States were grown primarily as a forage crop. Previous to 1930 the acreage harvested for beans in the United States as a whole was generally less than one-fourth of the total acreage grown for all purposes. The more extensive use of the soybean for pasturage, forage, and in the manufacture of soybean oil, soybean oil meal, and food products has resulted in an enormous increase in acreage and production of beans. In 1938, 35 percent of the total planted acreage of soybeans was harvested for

beans. The proportion grown for this purpose has increased rapidly since 1939, and in 1947, 80 percent of the total acreage was harvested for beans. The production by States is shown in figure 4. The phenomenal increase in acreage and production of the soybean in the United States may be largely attributed to the development of improved varieties for industrial utilization, adaptability of the soybean to mechanized farming, and the market demand for oil and protein. The dependability of soybeans to produce a crop under a wide variety of soil and weather conditions and the relative infrequency of disease and insect troubles are also contributing factors.



From Bureau of Agricultural Economics

Figure 4.—Production of soybeans is confined largely to the eastern half of the United States. Nearly 70 percent of the total production is in the southern part of the North Central States, with other areas of heavy production along the Arkansas-Tennessee Delta area of the Mississippi River and along the Middle Atlantic coast.

Most soybeans are determinate as to growth; that is, the plants reach a definite size according to variety and environment, and then mature and die. The erect character of growth, uniform maturing habit, and heavy seed yields of improved varieties contribute to the ease of harvesting and adaptability of the plant for bean production.

If not harvested at the proper time, many varieties will shatter their seed to a small extent. This is especially true during hot, dry weather. Growers planting soybeans for the first time should be sure to have adequate combining equipment available so they can begin harvesting soon after beans are mature. Some varieties will begin to shatter as soon as mature, whereas others will hold their seed satisfactorily for several weeks after reaching maturity. Varieties that will hold their seed with little or no shattering for 2 or 3 weeks after

reaching combine maturity are now available for most production areas.

Until special machinery was developed one of the most difficult problems in the development of the soybean industry was the harvesting of beans. Growers had to use the machinery at hand, with more or less unsatisfactory results. The combine now used in practically all soybean-producing areas has been undoubtedly one of the most important factors in the economic production of soybeans in the United States.

TIME OF HARVESTING

When the soybean plant approaches maturity, the leaves begin to turn yellow and drop; and before all of the pods are fully mature, the leaves have fallen, except in a few varieties.

When the combine is used it is necessary for the seed to reach full maturity to obtain the best results. The time of harvesting will vary somewhat with weather conditions. In a hot, dry fall, greater care should be taken in the harvesting of varieties tending to shatter. With varieties of the nonshattering type, little or no loss will be encountered in almost any kind of season.

Growers with little experience often attempt to obtain hay as well as beans from the same crop, but there is no stage at which the soybean can be cut for hay and beans at the same time, if quality and yield are to be considered. For the best quality of hay, the crop should be cut 4 to 6 weeks before it would be harvested for a high quality of seed.

DEFOLIATION

Most soybean varieties shed their leaves as the plants mature so that by the time the seeds are dry enough to store safely, the plants are defoliated and the stems, even if they have lodged earlier in the season, will have straightened up sufficiently for the crop to be combined without difficulty.

Experiments have been conducted to learn the effect of chemical defoliant sprays or dusts to hasten the maturing of plants and dropping of leaves. The general conclusion is that if defoliants are applied when the plants are nearing maturity, no appreciable effect is observed, whereas, if the defoliant is applied while the leaves are still green, maturity and leaf drop will be hastened but yield of beans will be cut. The recommended practice is to plant improved adapted full-season varieties that mature normally in time for combine harvesting. Producers desiring to plant small grains in the fall following soybean harvest may find the planting of an early-maturing soybean variety desirable.

METHODS OF HARVESTING

The combine-harvester is almost universally used for harvesting (fig. 5). Combine-harvesters can be obtained in sizes having 4½ to 12-foot cutter-bar lengths. This enables the grower to obtain a machine readily adaptable to his conditions. The self-propelled combine eliminates the loss usually encountered in opening up fields. The combine-harvester will operate quite satisfactorily at a speed of 5 miles per hour and with special sickle guards will pick up cleanly plants that are badly lodged.

Figure 5.—The combine-harvester has been important in increasing production of soybeans for beans. Sizes of combines are available to suit most farming conditions and provide an economical and rapid method for harvesting the crop.

By mounting on the harvester a seed tank that can be emptied into a truck, the crop can be harvested with no labor other than that of the combine operator and a truck driver.

Many combines are designed so that cylinder speeds may be considerably reduced and concave clearance adjusted to prevent the cracking of soybeans during threshing. This is especially necessary during periods of dry weather when beans become very dry and brittle. A slower cylinder speed also reduces the amount of small stem particles that interfere with cleaning of the beans.

WEATHER-DAMAGED BEANS

Quality is usually associated with the market value of soybeans for processing into oil and oil meal. Weather damage affects bean quality. Unfavorable weather during the ripening period, frost occurring while the beans are still green, or exposure to damp periods after the beans are fully mature, may cause damage. Very hot dry weather before the beans have matured usually results in wrinkled seed coats, and the beans are lower in oil content than normal. Frost-damaged beans may have cotyledons that are still green because normal ripening processes have been stopped. Oil from these beans will be green in color and somewhat harder to refine than oil from sound beans. Oil from beans that have been severely damaged by damp weather after reaching maturity is usually high in free fatty acids, causing severe refining losses and producing a product of poor quality for food use (fig. 6).

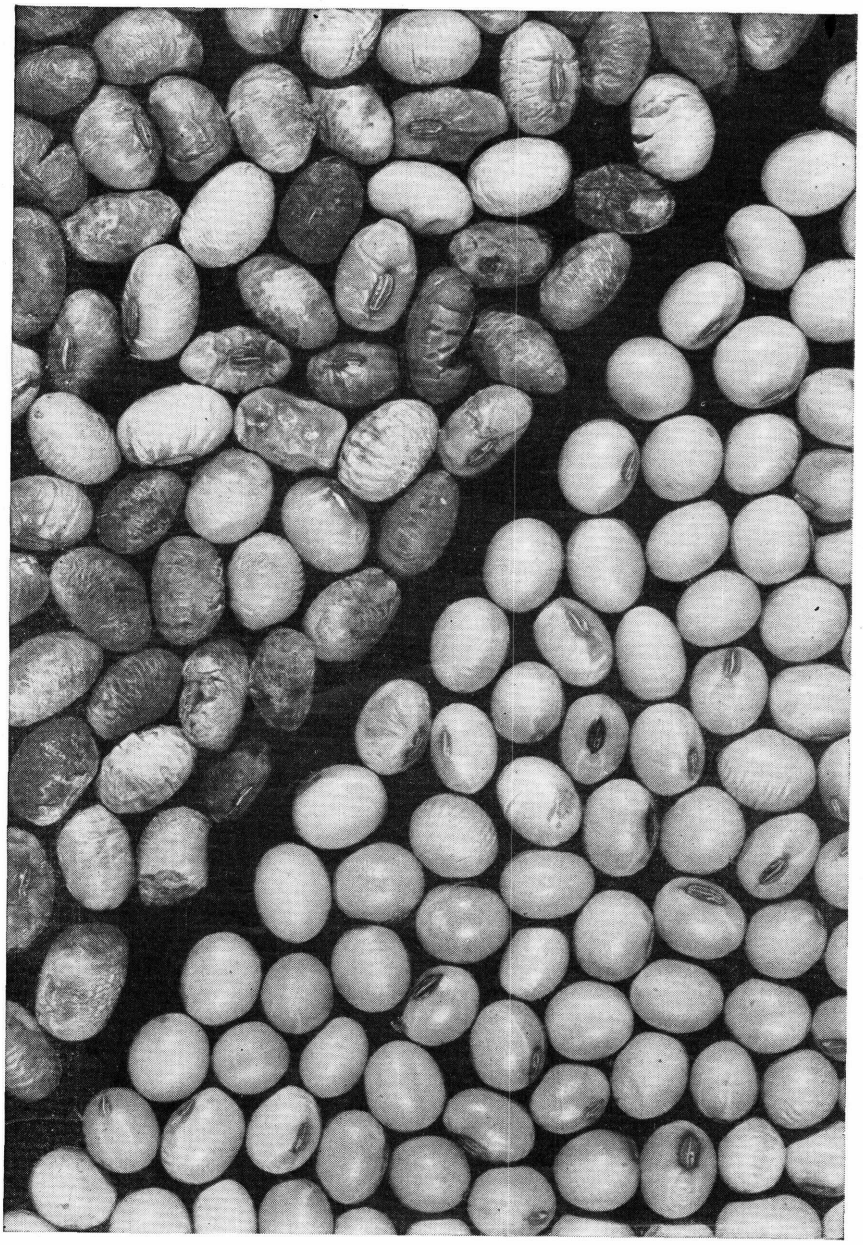


Figure 6.—Sound soybeans compared to weather-damaged beans. Prompt harvesting of the soybean crop after beans have reached maturity is important to prevent loss from shattering and to preserve good bean quality.

Beans of many soybean varieties deteriorate rapidly when the crop is left standing in the field after the plants have reached combine maturity. During periods of unfavorable weather this may be unavoidable, but an effort should be made to harvest the crop as rapidly as possible after it is ready.

YIELDS OF SOYBEANS

The best grain-producing varieties of soybeans, when adapted to the locality and grown under proper culture and favorable conditions, may yield from 35 to 45 bushels (60 pounds per bushel) to the acre. Yields of the same variety vary greatly in different parts of the country, partly because the variety is better adapted to some localities. Methods of production, seasonal conditions, soil fertility, and climatic adaptations also will affect yields.

Increased yields have accompanied increases in acreage of soybeans harvested for beans, since 1924. Acre-yield increases were greatest in the Corn Belt States, where average yields approximately doubled between 1924 and 1939. Since 1939, with greatly expanded acreage, average yields dropped to a slightly lower level in the Corn Belt States, but they remained about 65 percent above the yields obtained in the middle 1920's.

Yields have increased chiefly because of adapted improved grain varieties and better methods of production, especially of harvesting. The combine was first used for harvesting soybeans in 1924, and it is estimated that before the combine was used, nearly 30 percent of the beans were lost; whereas, the average loss in harvesting with the combine is about 9 percent.

More progress has been made in the earlier development of improved bean-producing varieties of soybeans for the North Central States than for any other region. Development of higher yielding bean varieties for the Southern States, however, has progressed rapidly during the past few years. Previously, a large proportion of the soybeans harvested for beans in the Southern States consisted of forage varieties, which yielded much less than the varieties now being grown for commercial purposes. Insects and diseases have reduced yields in the Southern States more severely than they have in the North Central States. Moreover, the soils that are well adapted to soybeans are more limited, and seasonal conditions are less favorable in many sections of the Southern States than in the Northern States.

STORAGE

The best precaution against storage losses in soybeans is to harvest when seeds are low in moisture. When soybeans containing over 13 percent moisture are bulked in large bins, spoilage or heating is quite likely to occur. In areas where soybeans often are harvested with a high moisture content, bins should be equipped with forced air ventilation to reduce the moisture in the beans.

In the United States, soybeans are shipped and stored in bulk. Approximately 60 percent of the crop is marketed in the fall and is stored at processing plants and terminal elevators until processed. Most of these bins are of reinforced concrete (fig. 7) and are designed so that the soybeans can be loaded and unloaded entirely by machinery.

Figure 7.—Soybean processors or terminal warehouses in the United States store soybeans in large concrete bins. Soybeans may be kept for several months in such bins, if the beans are sound and moisture content is maintained around 12 percent or below.

The storage of soybeans on the farm becomes an important problem in those seasons when they are harvested with a high moisture content. The Purdue Agricultural Experiment Station has found that if soybeans are placed in storage with a moisture content of 11 percent or less, they can be kept for a period of 1 year or even longer without appreciable deterioration or danger of spoilage. It was also found that soybeans may be stored during the winter with a moisture content of 12 to 13 percent, provided they are not stored in large bins. The lower the temperature at which the beans are stored, the less the danger of spoilage.

The Department of Agriculture, in cooperative storage studies with the Illinois Agricultural Experiment Station, found a close relationship between the changes in grade and quality and the moisture content of stored soybeans. At moisture contents of 11 percent or under, there was little decrease in germination, and under 12 percent there was no significant change in fat acidity, market grade, insect infestation, or temperature. Soybeans with 13 or 14 percent moisture graded "sample" at the end of 10 months because of a musty odor, and all soybeans with 14 percent moisture and above were musty, and graded "sample" after storage from January to July. The loss of viability was almost complete after 12 months' storage with moisture above 13 percent and severe with 12 to 13 percent moisture. Fat acidity increased noticeably at higher moistures.

If not sufficiently dry, soybeans must be dried to a moisture content at which they can be stored safely, and then should be kept in that condition in all parts of the storage place. Different methods are used for removing the excess moisture, such as natural ventilation, forced ventilation with natural air, moving or turning the seed, and forced ventilation with heat. Tests seem to indicate that mechanical drying is one of the most promising for drying the seed and maintaining the quality of soybeans in storage. It is also desirable to have the soybeans reasonably free of foreign material. Foreign material will not permit uniform air flow through the soybeans.

The Illinois Natural History Survey concluded in a study that under Illinois conditions insects are not a serious handicap in the storage of soybeans for two or more years when the bins are filled with soybeans averaging less than 12 percent moisture. It was found that no damage will occur from insects in soybeans containing less than 8 percent moisture, and those with 8 to 10 percent moisture were relatively safe. In bins with soybeans averaging 10 to 12 percent moisture content, insects will breed in those parts of the bin where the moisture exceeds 12 percent. Soybeans with 12 to 14 percent moisture will be attacked by a variety of insects, some of which may cause additional spoilage. Soybeans with a moisture content in excess of 14 percent are not safe for storage beyond the first winter, such stored seed being heavily attacked by insects as soon as the temperature becomes favorable in the spring. The most common insects are essentially the same as those found in stored corn. Their abundance depends on the extent of moldy grain in the bins.

In a study of the relation of temperature and seed moisture to the viability of stored soybean seed at the Plant Industry Station, Beltsville, Md., E. H. and V. K. Toole found that low moisture content and low temperatures were important factors in retaining viability. Seed stored with 18 percent moisture at 86° F. germinated poorly after

being stored 1 month. Lowering the temperature increased the length of life of the seed. At 36° this seed maintained good viability for 3 years, and at 14° nearly full germination was maintained for 6 years.

With a moisture content of 13.5 percent, soybean seed was dead after 5 months' storage at 86°, and after 2 years at 68°. Full viability was kept for 3 years at 50°. When the temperature was reduced to 36°, or lower, full germination was maintained for 10 years. Seed put in storage at a lower moisture content maintained full viability at a slightly higher temperature.

GRADING AND MARKETING

Standards for the grading of soybeans have been prepared by the Grain Branch, Production and Marketing Administration, United States Department of Agriculture, and information regarding this work may be obtained by writing the Department of Agriculture, Washington, D. C. The Production and Marketing Administration maintains a Federal soybean inspection service. It licenses inspectors at important shipping points and terminal markets in this country for the purpose of carrying out the grading work under the United States Grain Standards Act. In addition, it maintains a Federal force to handle appeals from inspections performed by licensees.

Any person who has a financial interest in a lot of soybeans and desires to obtain an official grade on them may make application to any Federal soybean inspector in the field service, or to the Production and Marketing Administration, Washington, D. C.[1] This agency also maintains a laboratory for determining oil content and oil quality on lots of soybeans. Information regarding this service is also available at the above address. The general adoption and use of the United States standards for soybeans by all agencies engaged in handling this crop should promote uniform grading and facilitate the marketing of the commodity.

[1] Provisions and regulations of the standards are readily available in the "Handbook of Official Grain Standards" issued by the Grain Branch.

U. S. GOVERNMENT PRINTING OFFICE: 1950

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